# RIVER ICE SPOTTER NETWORK

2021-2022 Training Information
Last Updated: November 9, 2021

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# OVERVIEW

- Why do we need river ice spotters?
- Ice jam flooding examples
- Where do we see river ice and ice jams?
- River ice formation, ice types, ice break-up, ice cover examples
- Ice jams
- River ice spotter network procedures

# WHY DO WE NEED RIVER ICE SPOTTERS?

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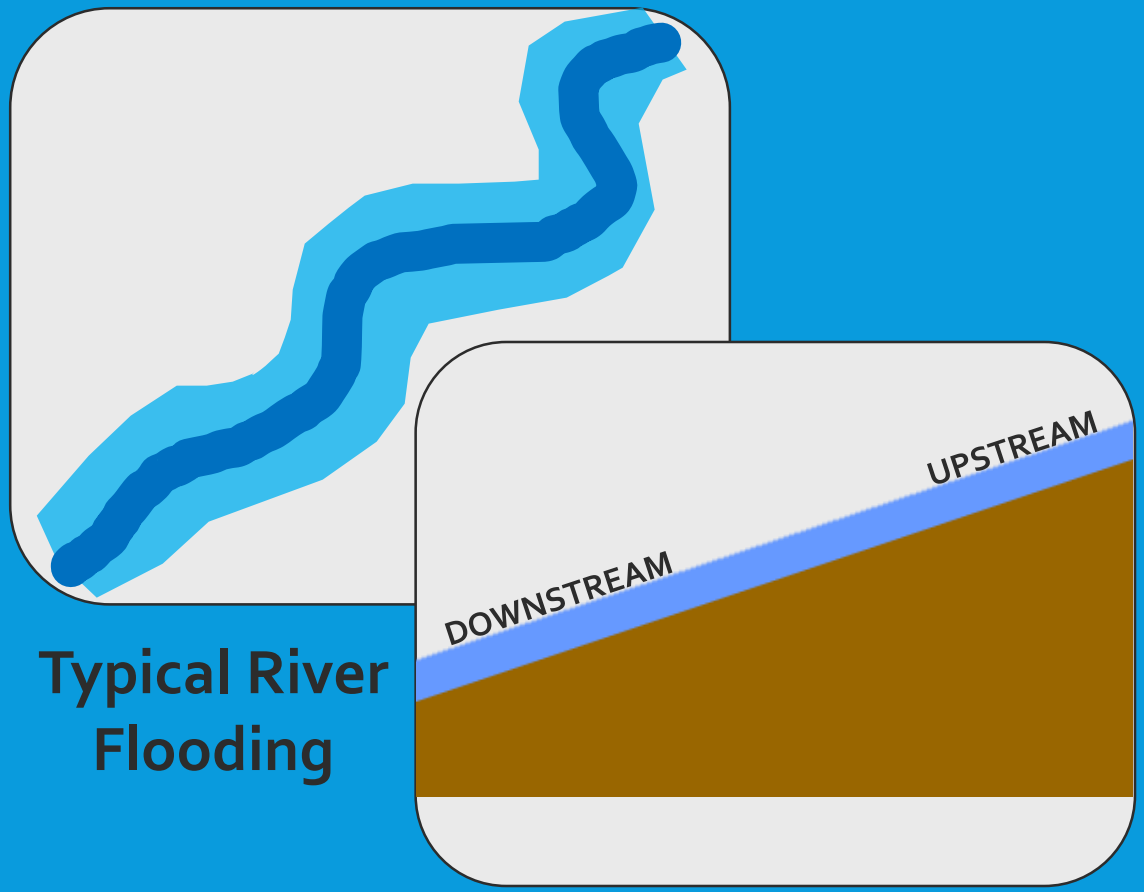
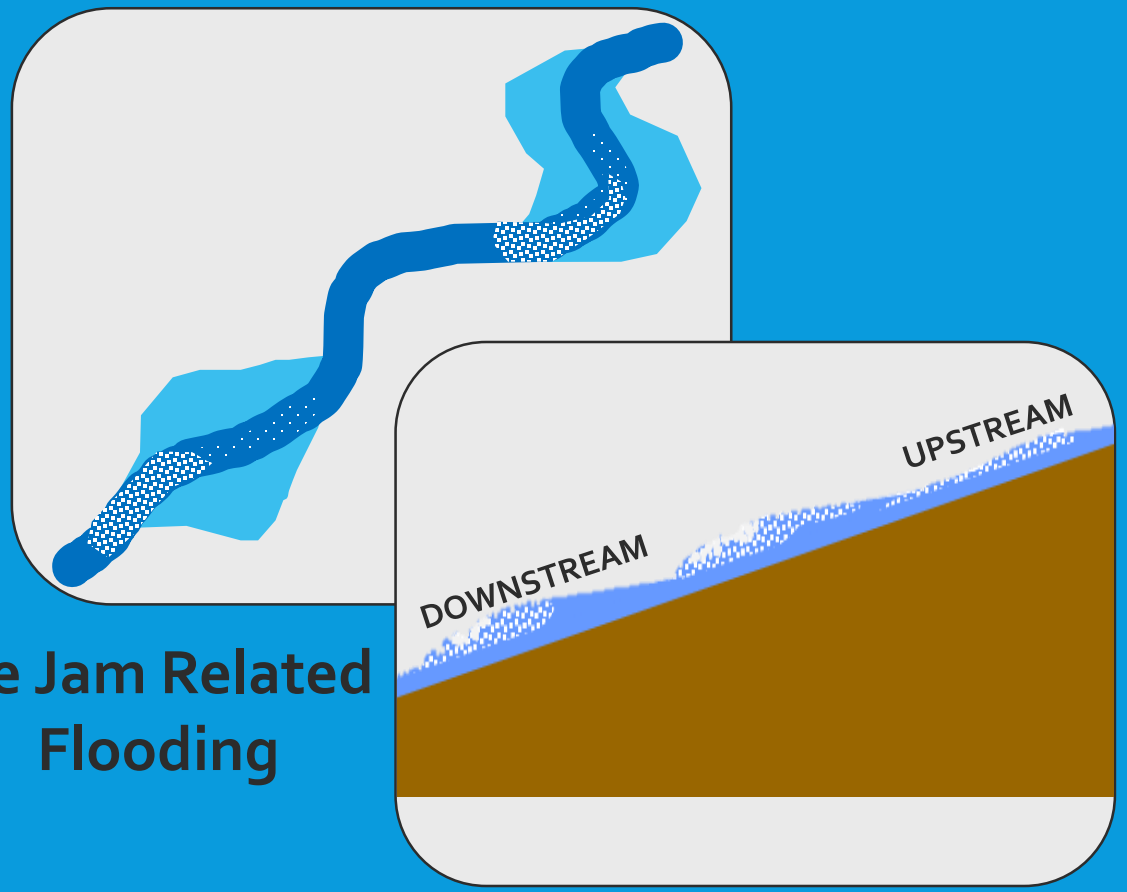
| | Typical River Flooding | Ice Jam Related Flooding |
|---|---|---|
| **Cause** | Typically rainfall or snowmelt | River ice, also possibly rainfall and snowmelt |
| **Extent/Coverage** | Typically large sections of rivers and streams | Typically localized areas |

# WHY DO WE NEED RIVER ICE SPOTTERS?



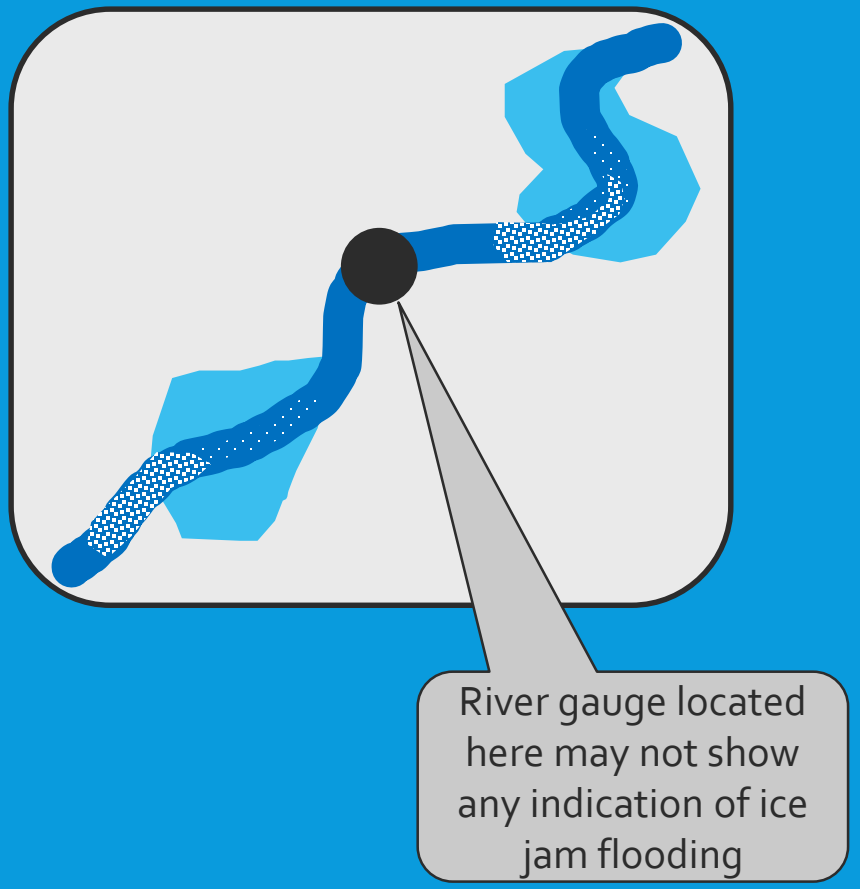

**Typical River Flooding**




**Ice Jam Related Flooding**

# WHY DO WE NEED RIVER ICE SPOTTERS?

- River gages provide only limited indication of ice
- Ice jams occurring away from river gauges may not be detected at all
- Ice jam flooding can happen in minutes and early notification allows for timely warnings
- Several rivers have known, recurring, ice jam problems



# WHY DO WE NEED RIVER ICE SPOTTERS?

**Information Needed to Assess Flood Risk from Ice Jams**

- River ice cover
- River ice type
- River ice coverage trend (increasing/decreasing)
- Whether or not localized ice jams and/or flooding is occurring

*Image Credit: Joe Gillespie*

**This information can only be obtained by visual observations!**

# ICE JAM FLOODING EXAMPLES

# ICE JAM FLOODING EXAMPLES

*Image Credit: Unknown*

- Rock River, Winnebago County
  Winter 2007-2008

# ICE JAM FLOODING EXAMPLES

*Image Credit: Unknown*

- Kankakee River at I-55 bridge Winter 2007-2008

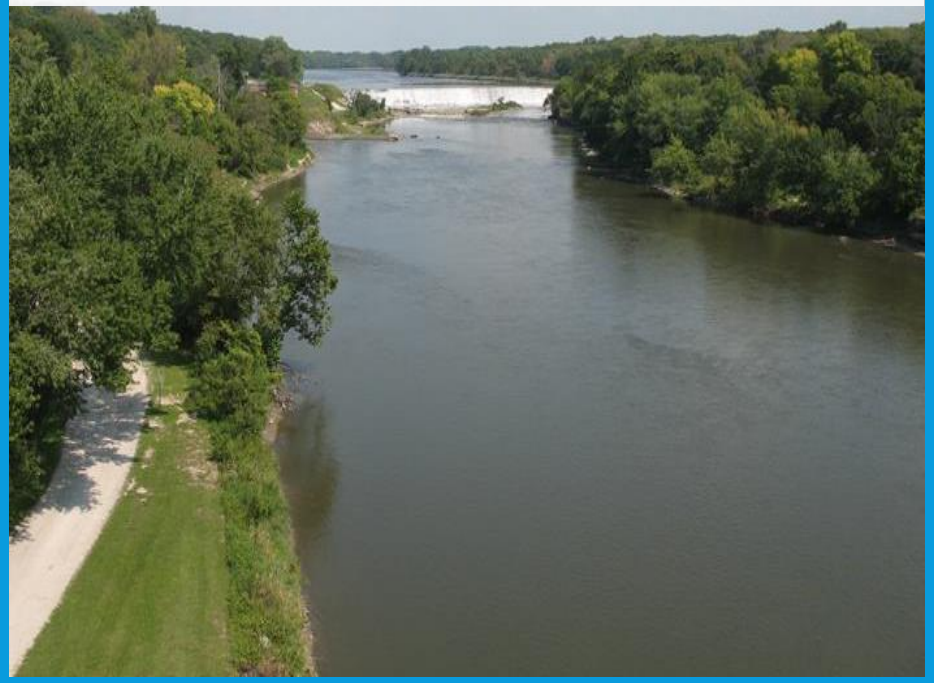
# ICE JAM FLOODING EXAMPLES

- Rock River, Dixon
  Winter 2009-2010

*Image Credits: Unknown*

# ICE JAM FLOODING EXAMPLES

Fox River at Dayton Dam – Warm Season



Winter 2009-2010

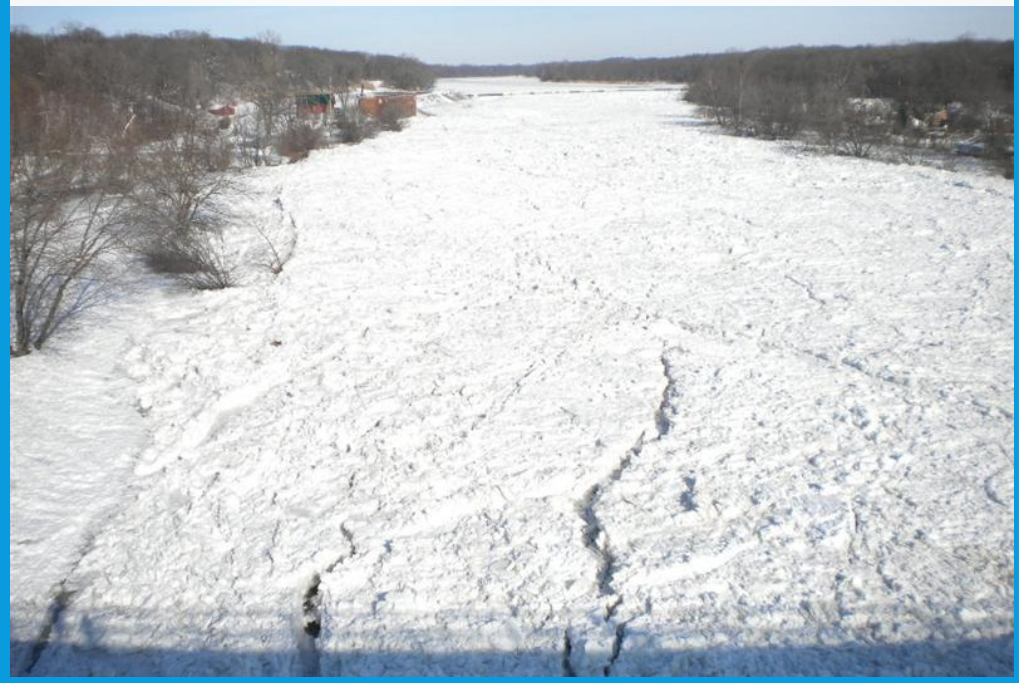


*Image Credits: Unknown*

# ICE JAM FLOODING EXAMPLES

- Winter 2018-2019…. Widespread river ice problems

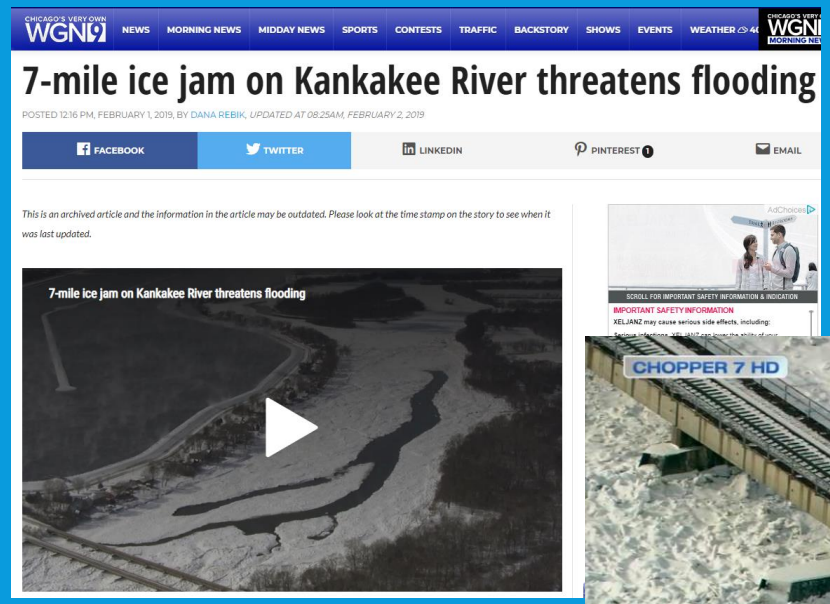
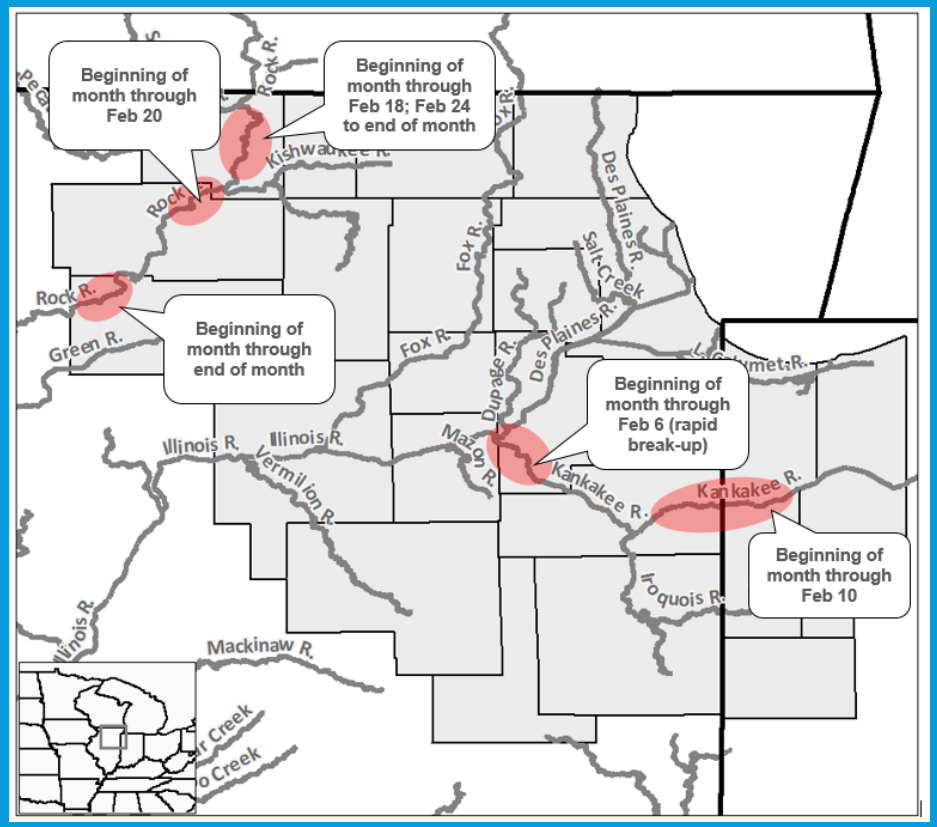



*Image Credit: WGN, WLS*

# ICE JAM FLOODING EXAMPLES

*Image Credits: Sentinel-2, Sentinel Hub*

# WHERE DO WE SEE RIVER ICE AND ICE JAMS?

# WHERE DO WE SEE RIVER ICE JAMS?

**Areas with…**

- Daily average January temperatures around 0C (32F) or colder
- 100 or more average accumulated freezing degree-days

**Freezing Degree Days**

A measure of how cold it has been, and for how long. The amount of degrees below freezing for a daily average temperature, summed over a particular number of days.

For example, an average temperature of 30F adds 2 freezing degree days to the running total.

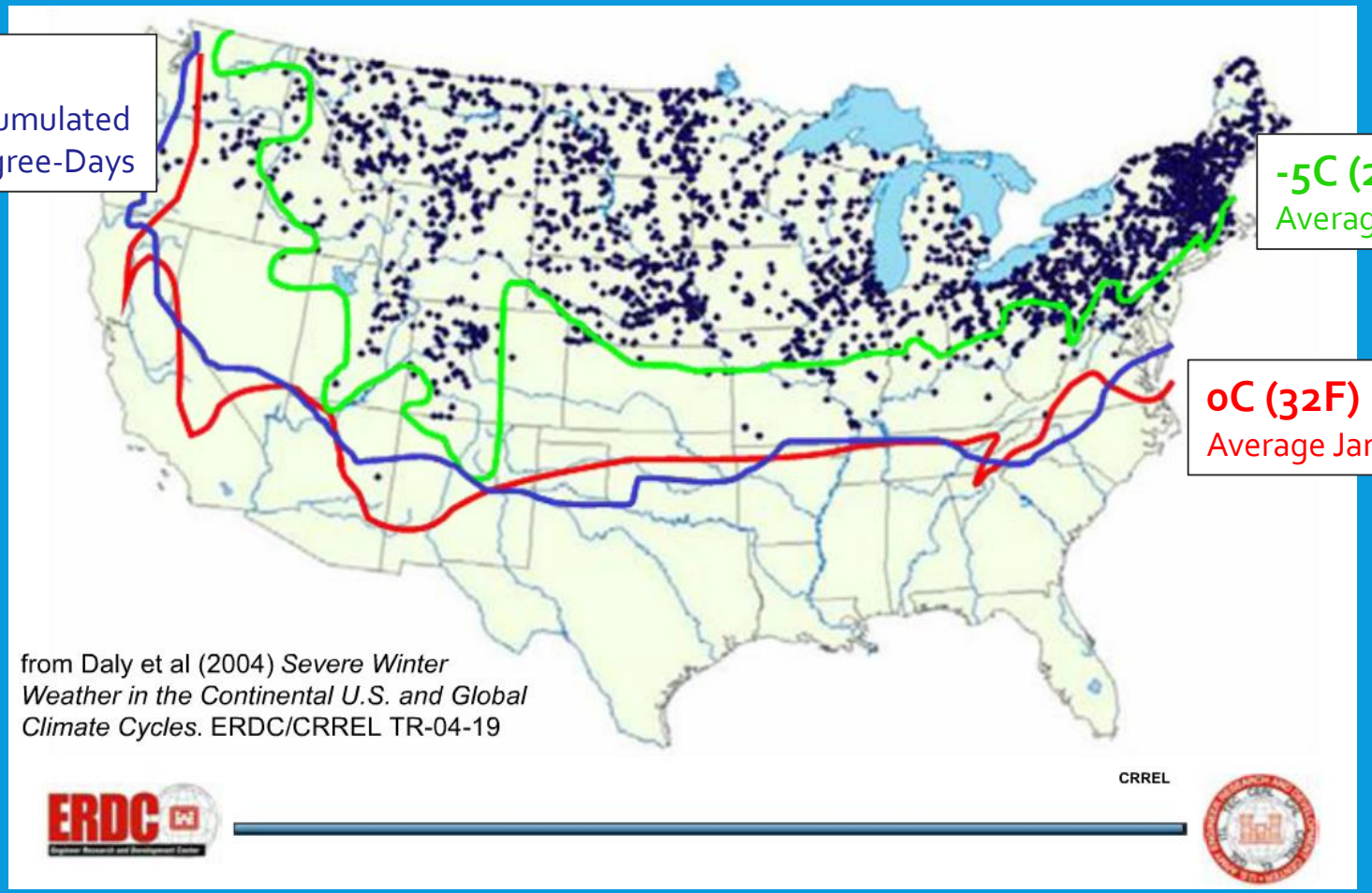
# WHERE DO WE SEE RIVER ICE JAMS?

**100**
Average Accumulated Freezing Degree-Days

**-5C (23F)**
Average January Temperature

**0C (32F)**
Average January Temperature

*1 dot = 1 ice jam*

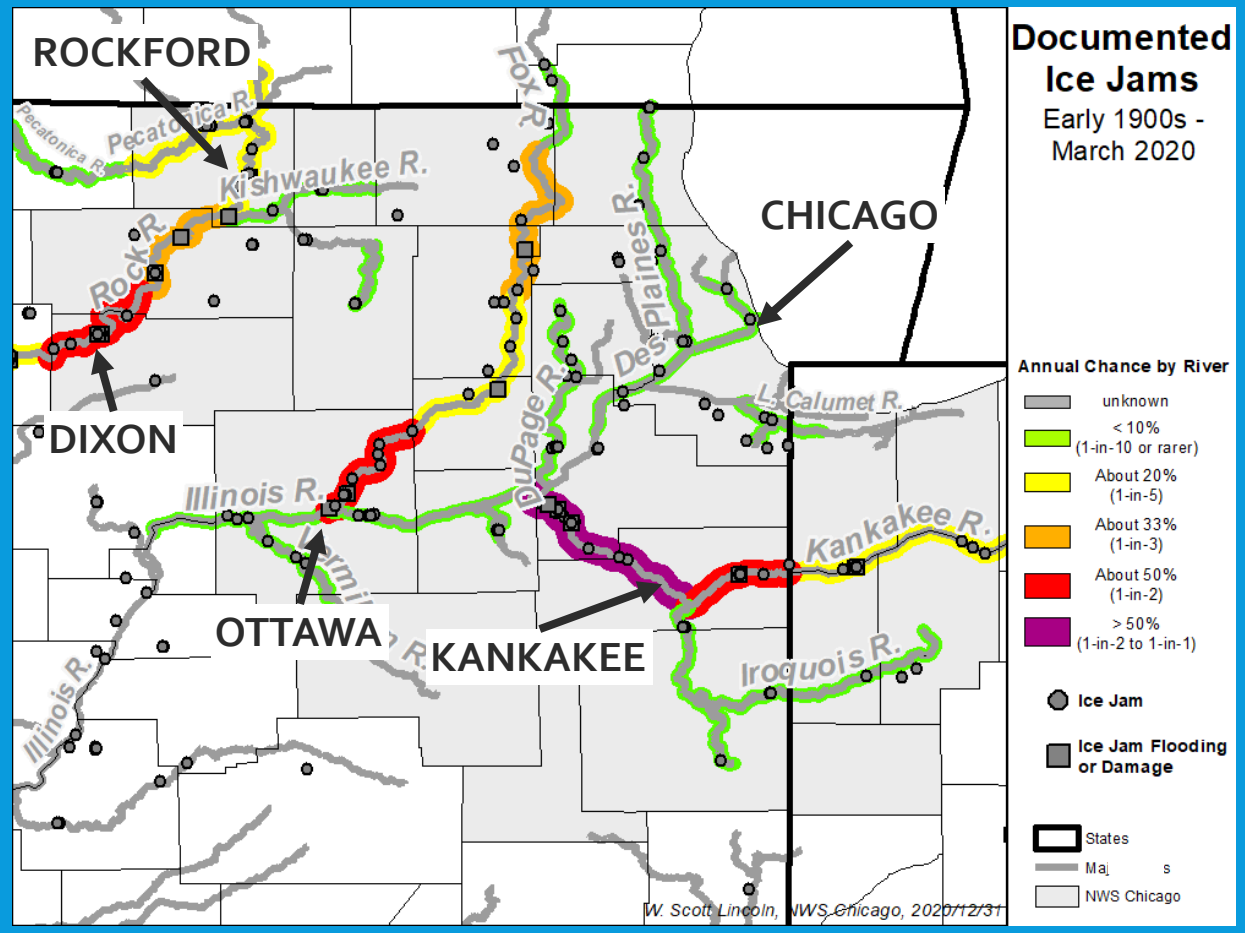


# WHERE DO WE SEE RIVER ICE JAMS?

**Common river ice trouble spots:**

- Stream constrictions, such as bridges
- Sharp meanders
- Obstructions, such as islands
- Change in river slope

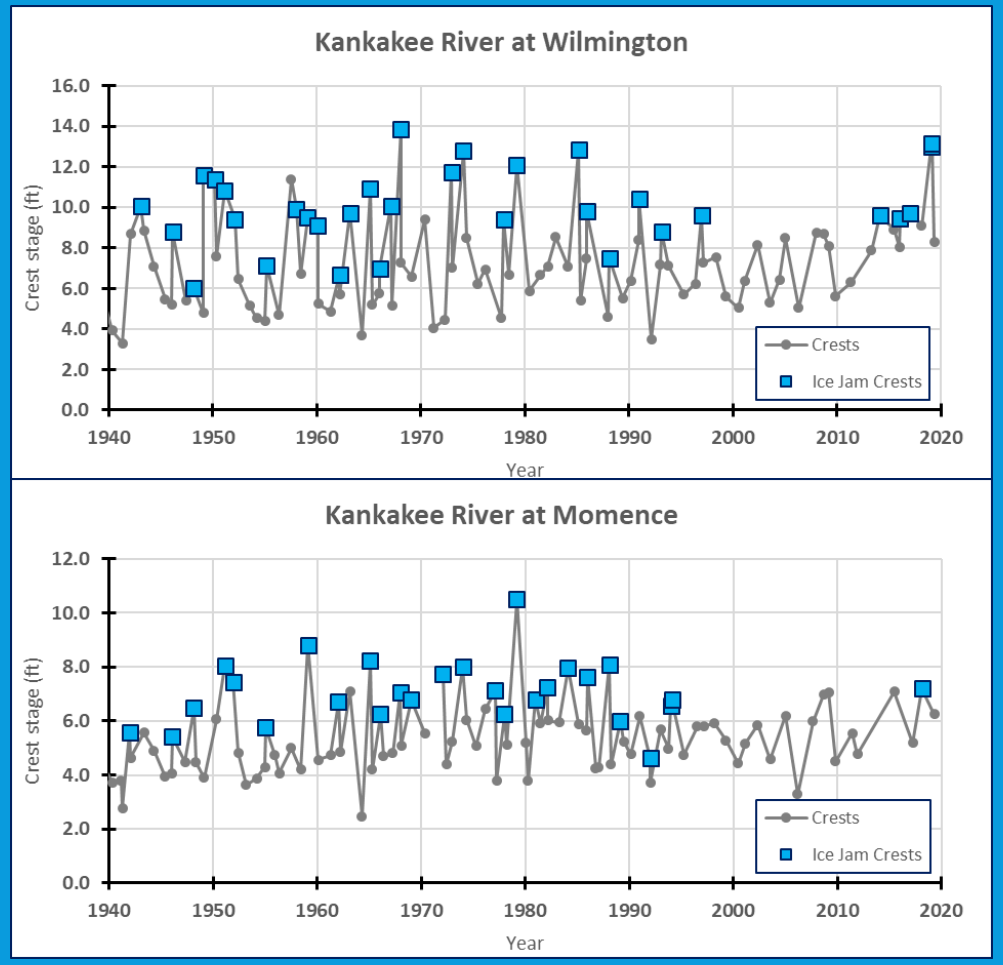
# LOCAL AREA RIVER ICE JAM CLIMATOLOGY




- Ice jams have been documented on a majority of rivers across northeast Illinois and northwest Indiana
- Multiple rivers have experienced damaging ice jams
- Some particularly ice-prone locations have about a 50% (1-in-2) chance of experiencing an ice jam in a given year

# RIVER ICE AFFECTED FLOOD CRESTS

- Many instances of river flood crests due to ice
- For example, some of the largest documented river crests along Kankakee River have been ice affected



# WHEN DO WE SEE RIVER ICE AND ICE JAMS?

# WHEN DO WE SEE RIVER ICE JAMS?

**Typical weather conditions associated with past ice jams in our area:**

- Daily average temperature < 20F
  (range 5-20F depending on the river)

- Accumulated freezing degree days >50
  (50-500 depending on the river and type of ice jam)

# WHEN DO WE SEE RIVER ICE JAMS?

**What river conditions do we watch for?**

- Elevated streamflow heading into first big cold wave (early winter to mid winter)
- A significant river rise after low water levels have frozen in place
- These river conditions occurring at the same time as favorable weather conditions

# RIVER ICE TYPES

# RIVER ICE FORMATION

**Columnar Ice**

- Often forms in slow, smooth flow or no flow.
- Transparent, allows solar penetration, becoming "candled" as it decays

**Frazil Ice**

- Frequently forms in dynamic, turbulent flow. Found frequently in ice-affected rivers especially early in the winter season.
- More opaque, resists solar penetration

# RIVER ICE TYPES

**Frazil Slush** **Pancake Ice** **Anchor Ice**




*Image Credit: USACE CRREL, New Brunswick Ice Manual, USACE CRREL, USACE CRREL*

**Frazil ice**
Fine, small, needle-like structures or thin, flat, circular plates of ice suspended in water. In rivers and lakes it is formed in super-cooled, turbulent water.

**Pancake ice**
Circular, flat pieces composed of frazil and slush ice with a raised rim; the shape and rim are due to repeated collisions.

**Anchor ice**
Submerged ice attached or anchored to the river bed, regardless of the nature of its formation.

# RIVER ICE TYPES

**Sheet Ice** **Border Ice** **Candled Ice**

*Image Credit: USACE CRREL, USACE CRREL, Dennis Kalma, USACE CRREL*

**Sheet ice**
A smooth, continuous ice cover formed by freezing in the case of lake ice, or by the accumulation of ice floes into a single layer in the case of river ice.

**Border ice**
Ice formed along and fastened to the shore. Border ice does not extend across the entire width of the river. Also called shore ice.

**Candled ice**
Decayed sheet ice that assumes the appearance of thin vertical crystals shaped like candles.

# RIVER ICE ACCUMULATION

**Where to look for ice accumulation?**

- Near river banks and areas of tranquil water
- Change in slope from steep to mild
- Downstream of turbulent water such as rapids or dams
- Stream constrictions, such as bridges
- Sharp meanders/bends
- Obstructions, such as islands

# RIVER ICE ACCUMULATION

**Common river ice progression**

- After rapid onset of extreme cold, frazil ice forms on open or mostly open rivers.
- Frazil ice combines into frazil pans, and then may accumulate enough to cover entire river, turning into sheet ice.
- Continued cold thickens existing sheet ice and more ice flows from upstream
- Warmer temperatures and a large river rise may break up sheet ice, leading to an ice jam.
- Large pieces of flowing ice may get stuck at constrictions or bends, leading to an ice jam.

# RIVER ICE COVER EXAMPLES


~30% ice cover
Frazil ice pans/pancake ice


~60% ice cover
Border ice/sheet ice


~100% ice cover
Water and ice in overbank areas indicates flooding due to an ice jam

# RIVER ICE DEFINITIONS

**Anchor ice**
Submerged ice attached or anchored to the river bed, regardless of the nature of its formation.

**Border ice**
Ice formed along and fastened to the shore. Border ice does not extend across the entire width of the river. Also called shore ice.

**Break up jam**
Accumulation of broken ice pieces that restrict the flow of water; may contain frazil ice or remnants of freeze up jam.

**Candled ice**
Decayed sheet ice that assumes the appearance of thin vertical crystals shaped like candles.

**Frazil ice**
Fine, small, needle-like structures or thin, flat, circular plates of ice suspended in water. In rivers and lakes it is formed in super-cooled, turbulent water.

**Freeze up jam**
Accumulation of frazil ice that restricts the flow of water; may contain some broken border ice pieces.

**Pancake ice**
Circular, flat pieces composed of frazil and slush ice with a raised rim; the shape and rim are due to repeated collisions.

**Shear walls**
Ice left along shoreline when a freeze-up or break-up jam fails and moves downstream.

**Sheet ice**
A smooth, continuous ice cover formed by freezing in the case of lake ice, or by the arrest and juxtaposition of ice floes in a single layer in the case of river ice.

**Slope change**
A change in the slope of the river. Typical examples occur where two rivers meet, and at the upstream end of a dam or reservoir pool.

**Slush ice**
A floating agglomeration of loosely packed frazil ice that remains separate or only slightly frozen together.

*Credit: USACE CRREL*

# ICE JAMS

# ICE JAMS

**Where do they typically occur?**

- Stream constrictions, such as bridges
- Sharp meanders
- Obstructions, such as islands
- Change in river slope

**Repeat Offenders**

- Kankakee, Fox, and Rock Rivers

# RIVER ICE BREAKUP

**Thermal**

- Ice cover melts in place, no flash floods
- Water on ice, darker ice color, or debris (such as dirt and leaves) on ice decreases reflection, may promote melting
- Open water areas absorb sunlight and help warm water temperatures


*Image Credit: Unknown*

# RIVER ICE BREAKUP

*Image Credits: Unknown*

**Mechanical**

- Increase in river flow from precipitation and/or snowmelt breaks up ice cover
- River rise about 1.5-3.0 times ice cover thickness typically required
- Mechanical break-up may cause flash flooding
- Lower water levels at and after freeze-up can mean less ability for river to transport ice and lead to jams in unexpected places

# RIVER ICE BREAKUP





**Example of mechanical river ice breakup**

1. Prior to river rise; sheet ice in place

2. River rises due to increased streamflow

3. River rise breaks up sheet ice cover

4. River ice moves downstream; large blocks of sheet ice and possibly shear walls left behind on banks

# ICE JAMS

## Freeze-Up

- Composed of almost entirely frazil ice
- Flash floods unlikely; slower-onset flooding possible

*Image Credit: Unknown*

## Break-Up

- Ice breaks into chunks which move downstream and then get stuck
- Floods/Flash floods possible

*Image Credit: USACE CRREL*

# ICE JAMS


*Video Credit: NWS Caribou, ME*

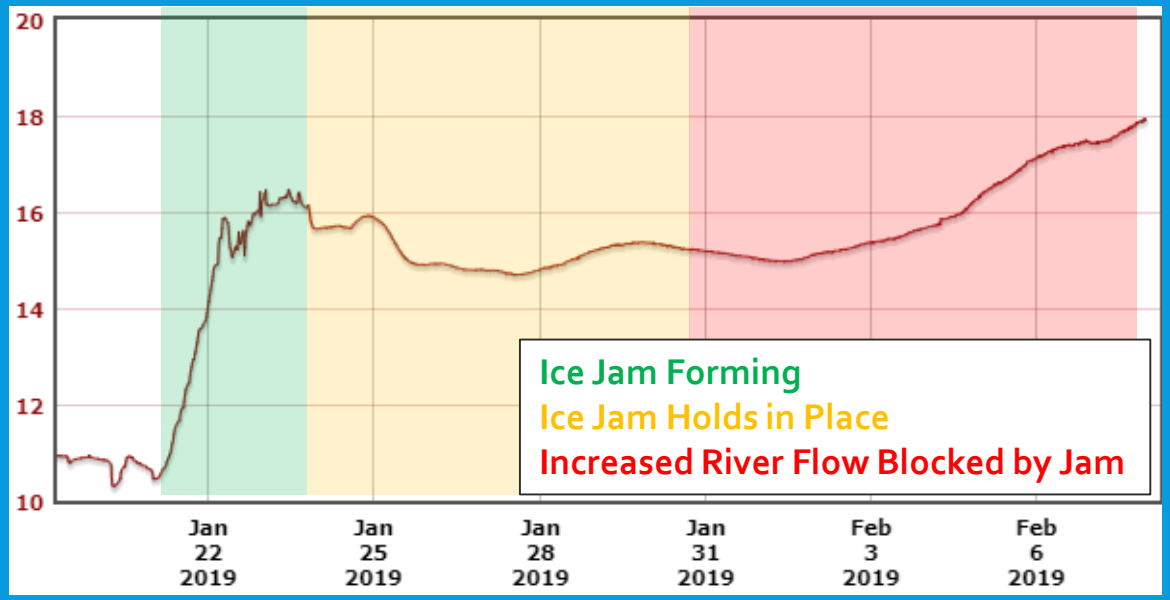
**Break-Up**

- River rise due to rainfall or snow melt lifts sheet ice
- River ice breaks up, moves down river, and may jam in place temporarily or for days
- While jammed, water may accumulate upstream, causing flooding

# ICE JAMS

**Ice jams on a hydrograph**

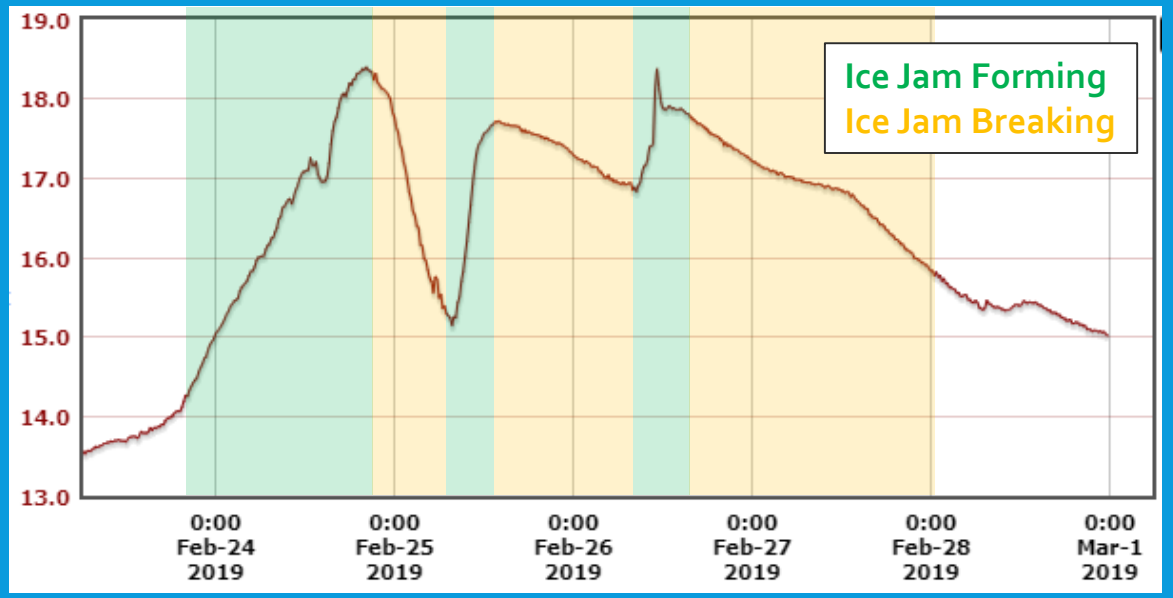
- Ice jam forms near gauge and holds in place for multiple days
- Ice jam breaks slightly, but stays in place enough to keep water levels elevated
- Increased river flow from upstream is blocked by the jam and causes river to rise



# ICE JAMS

## Ice jams on a hydrograph

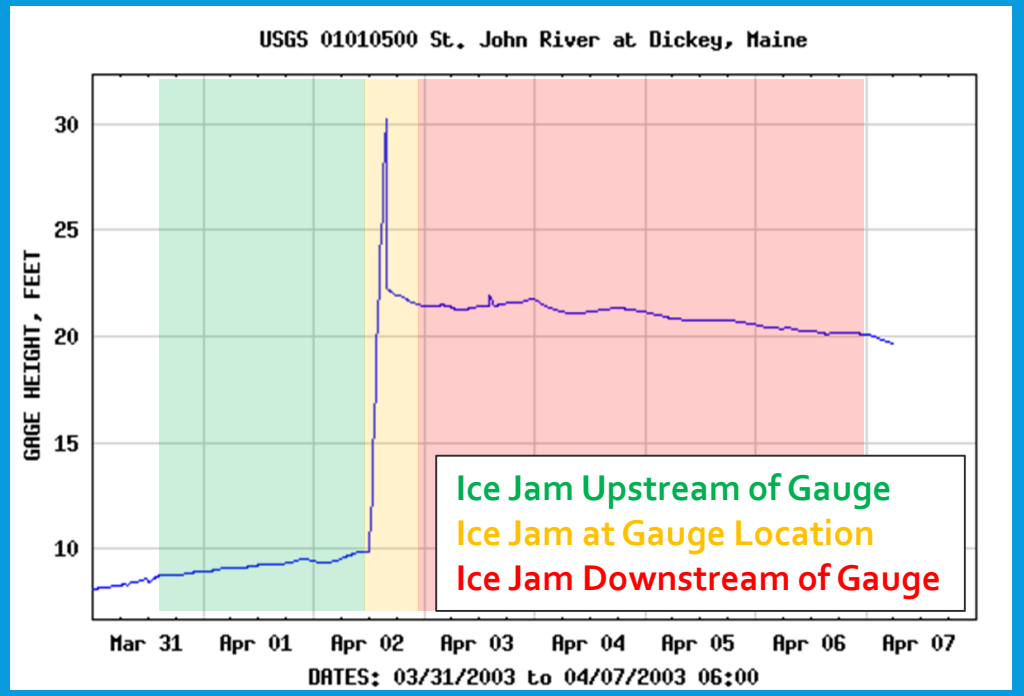
- Ice jam forms near gauge, and breaks up, multiple times



# ICE JAMS

## Ice jams on a hydrograph

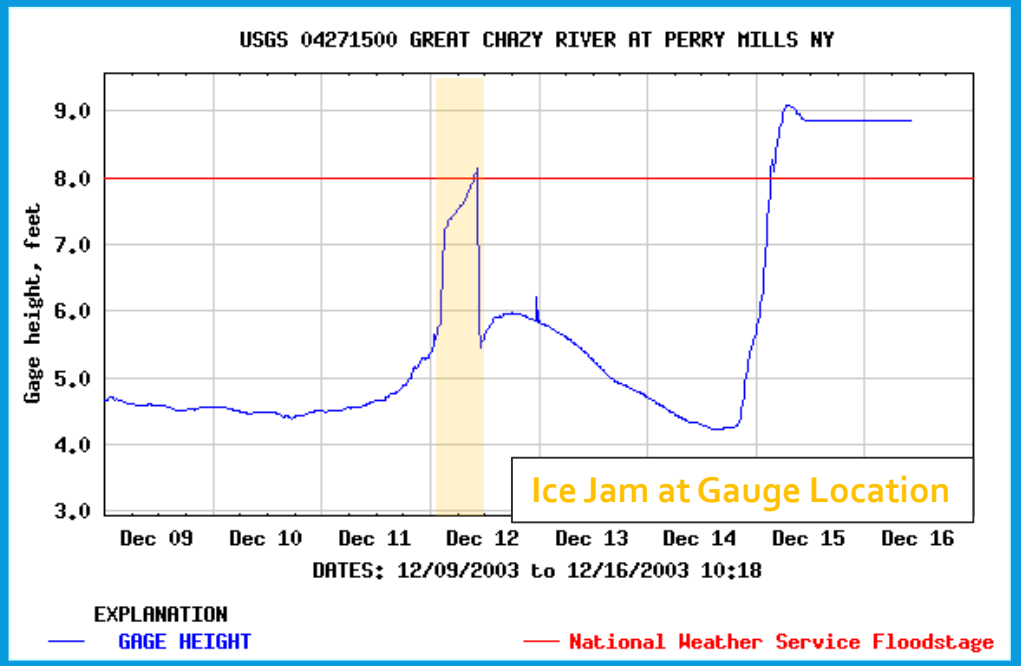
- Ice jam moves past gauge causing sudden spike in water level
- Ice jam just downstream of gauge causes continued backwater effect



# ICE JAMS

**Ice jams on hydrograph**

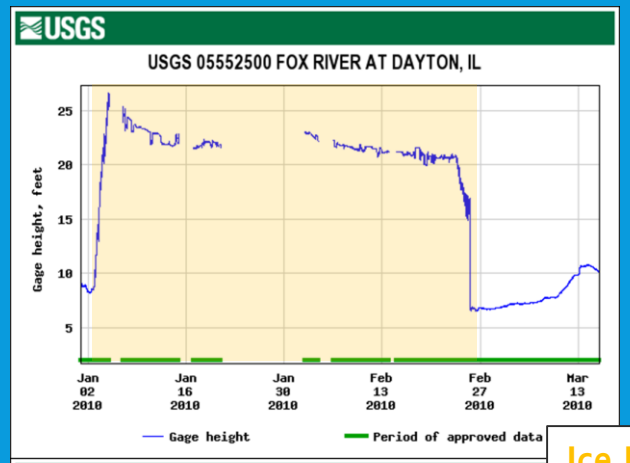
- Ice jam moves past gauge causing sudden spike in water level
- Ice jam breaks up
- Period of open river, possibly still ice affected
- Ice jam begins again

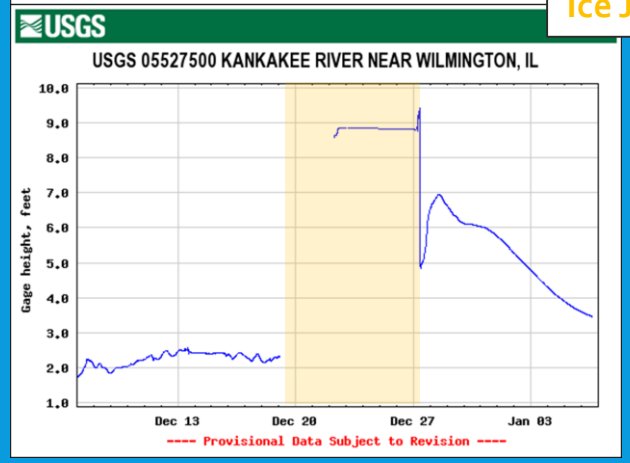


# ICE JAMS

## Ice jams on hydrograph

- Ice jams may break up very quickly, causing flash flooding downstream



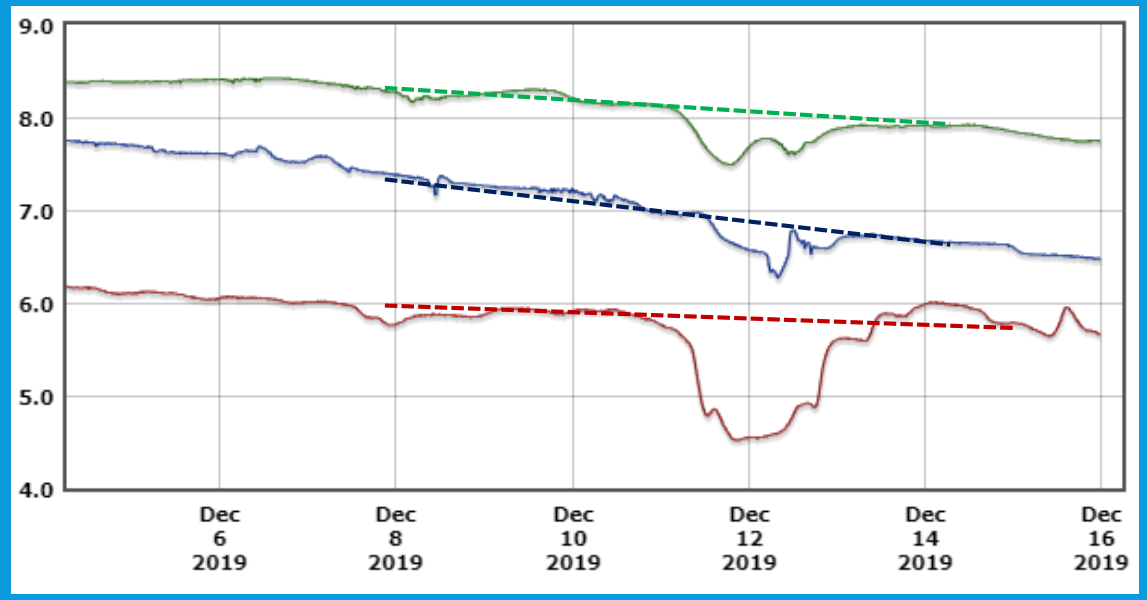




Ice Jam at Gauge Location

# ICE JAM OR "ICE BITE?"

**Ice Abstraction or "Ice Bite"**

- A rapid freeze-up of upstream lakes and/or streams may briefly drop river flow enough to cause a noticeable drop
- This effect, sometimes called "ice bite" can look similar to the effect caused by an upstream ice jam
- Effect is temporary
- During ice bite event, typically no ice on the main channel but small tributaries freeze quickly



# RIVER ICE SPOTTER PROCEDURES

# WHAT INFORMATION IS NEEDED?

**Information Needed**

- River ice cover
- River ice type
- River ice coverage trend (increasing/decreasing)
- Whether or not localized ice jams and/or flooding is occurring

# WHEN TO REPORT

**River Ice Spotter Report Times**

- Weekly on Monday by 9:00 AM.
  **Weekly reports may still be collected through 11AM but may not be included in weekly summary product.*
- Other times when significant changes are noted
- Any time an ice jam or flooding is observed

# HOW TO REPORT

- Simple web form accessible via computer or cell phone web browser

NWS Chicago River Ice Spotter Form

* Required

River ice spotter reports are generally collected from December 1 to March 31. Reports are requested every Monday morning prior to 11am (9am if possible). Reports many be submitted more frequently; this is especially helpful when river ice is changing. If something time-sensitive is observed, such as a rapidly forming or breaking ice jam that may cause flooding, please call the NWS Chicago office using the provided phone number.

Spotter ID is the identifier provided at the beginning of the winter season. Format: XX-99 Using a different format may delay the receipt of your report.

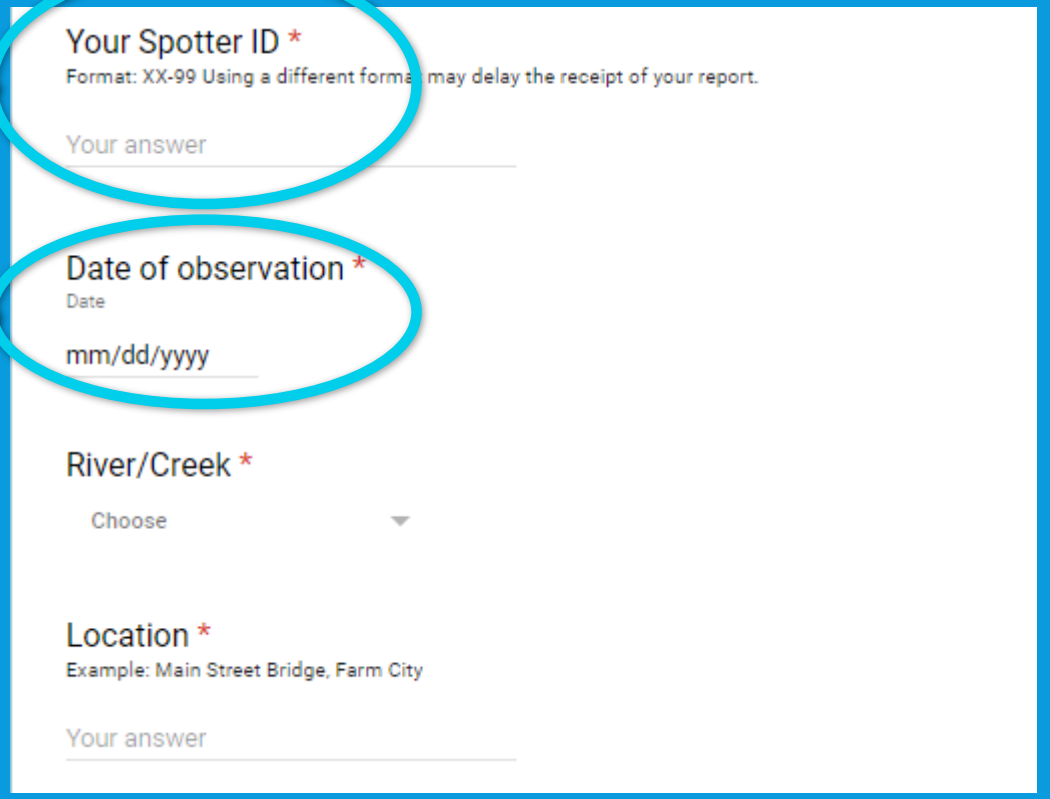
Location is a description of where ice was observed. Example: Main Street Bridge, Farm City

- For rapid changes in ice or flooding, call NWS Chicago/Rockford office

# HOW TO REPORT

**Your Spotter ID**
The ID sent to you at the beginning of the winter season. If you are observing ice away from your usual location enter "NA" instead of your spotter ID.

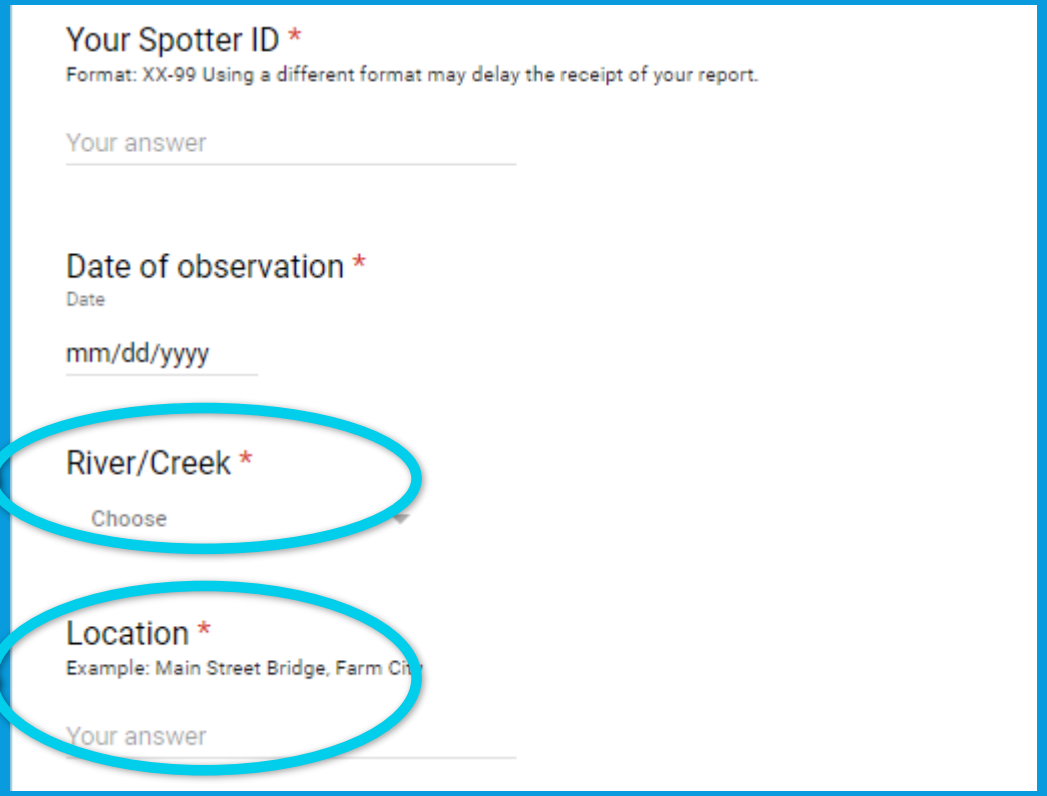
**Date of Observation**
The date ice was actually observed. Not necessarily the date that you are entering information into the web form.



# HOW TO REPORT

**River/Creek**
The waterway on which ice is observed. If your waterway isn't listed, please contact our office.

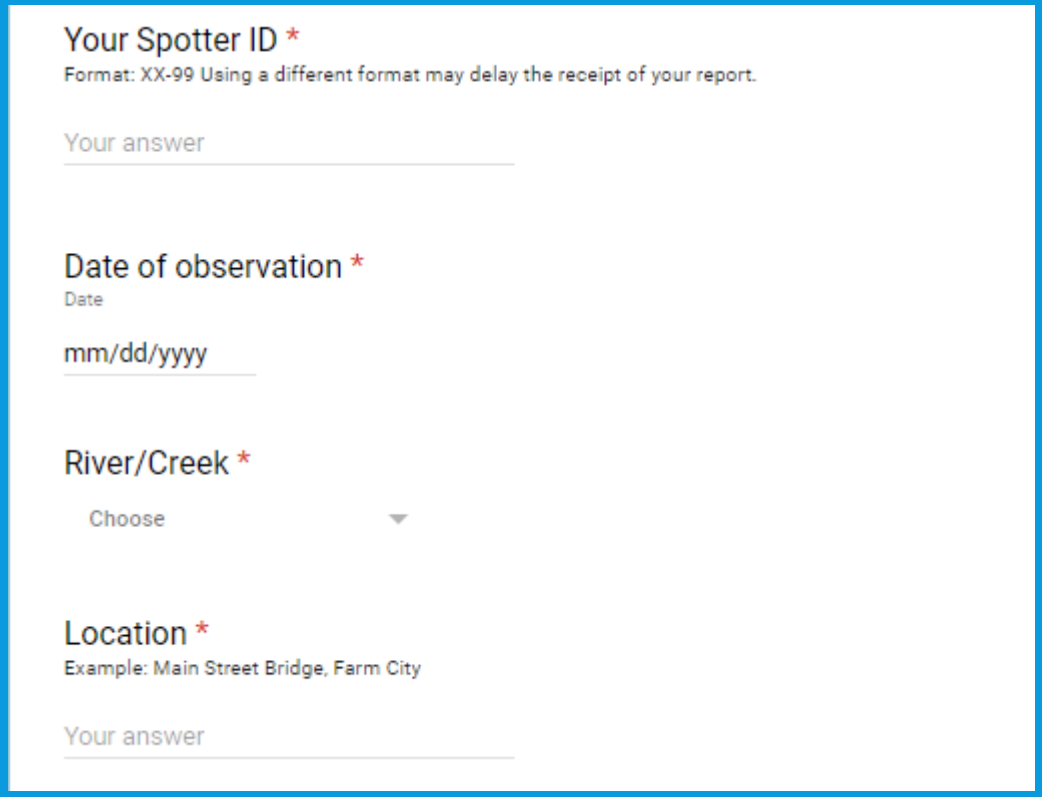
**Location**
General location of ice observation, such as town name or nearby bridge crossing. Use this box to indicate location if you are making a special observation away from your usual location, or if the river/creek name isn't listed.
Exact address or latitude/longitude is not necessary, especially if you are reporting from your usual location.



# HOW TO REPORT

**Important Notes**

- Type your spotter ID following the "XX-NN" format exactly.
  **Not following the standard format will prevent your report from making it to the weekly summary product and will delay its availability to the NWS.*
- Date of observation should match when you actually observed ice. If you can't report on Monday and report on Sunday, put Sunday's date.



# HOW TO REPORT

**River Condition**
General description of ice cover (if any). Open is approximately 0-20% cover, partly frozen is approx. 20-80% cover, and frozen over is approx. 80-100% cover.

**River Ice Trend**
General description of the trend in ice cover over last few days (not necessarily change since previous Monday).

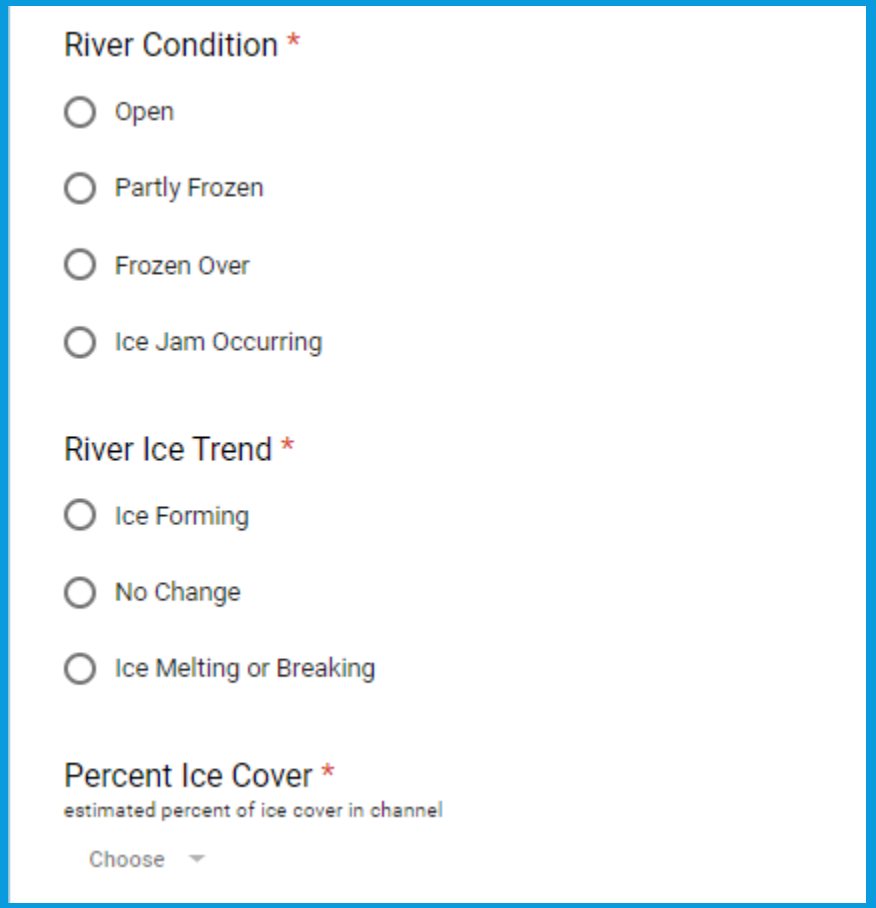
**Percent Ice Cover**
Estimate of the percentage of river covered by ice at the observing location.

# HOW TO REPORT

**Important Notes**

Please call our office if:

- River ice is forming or breaking-up rapidly (less than 1 day)
- A new or changed ice jam is observed
- Flooding is observed



# HOW TO REPORT

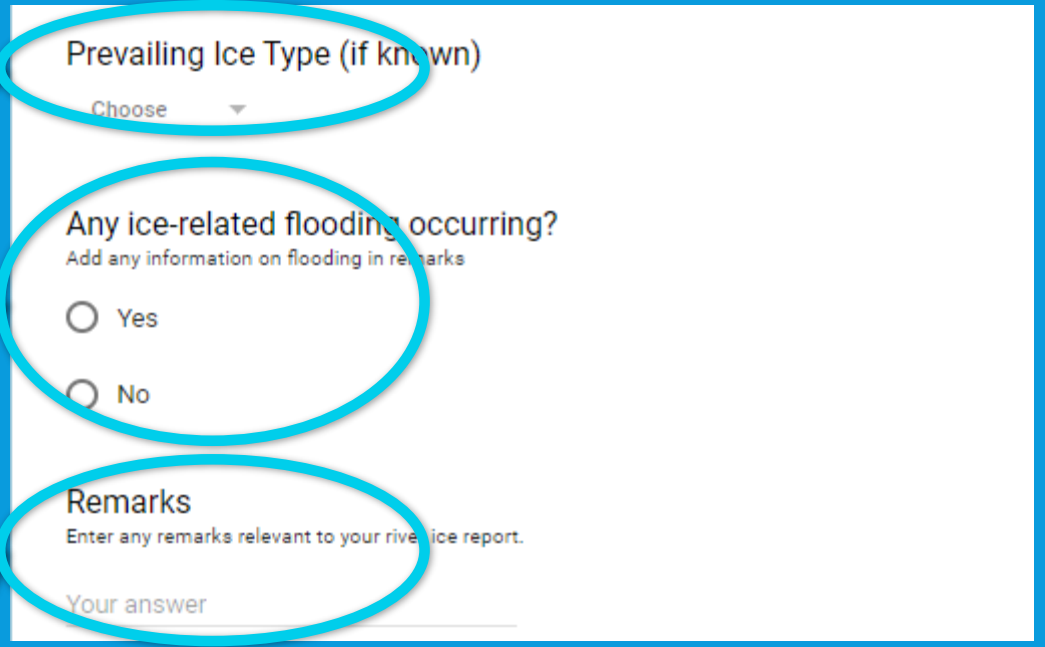
Using the river ice guide, document the type of ice observed (if possible)

Feel free to leave us any additional comments about the ice

**Prevailing Ice Type**
General description of the most common ice type. See "River Ice Types" section or the river ice reference guide.

**Any ice-related flooding occurring?**
Indicate whether or not the stream/river has overflowed its banks related to ice accumulation and/or an ice jam.

**Remarks**
Leave any additional observations here that you think may be helpful. If you are sending in a report away from your usual location, this is where you would provide your name and spotter ID, leaving the spotter ID box as "NA."



# ICE SPOTTER SAFETY

**Important Notes**

- Always observe river ice from a safe location!
  - Away from the immediate shore
  - Away from vehicle lanes on bridges

- **Never** venture on to ice to observe conditions. This will provide no additional information and will put your life at risk.

***SAFETY***

***All visual observations of ice conditions should be done from a safe location only.***

***Never venture out on ice to take an observation.***

# HOW IS INFORMATION USED

```
000
FGUS83 KLOT 251626
RVSLOT

HYDROLOGIC STATEMENT
NATIONAL WEATHER SERVICE CHICAGO
1111 AM CDT MON MAR 25 2019

WEEKLY RIVER ICE CONDITIONS

REPORTED BY RIVER ICE SPOTTERS
ID        LOCATION            RIVER             ICE              PCT ICE
                              CONDITION         STATUS             COVER
DES PLAINES RIVER...
DP-26     LIBERTYVILLE IL     OPEN              NO CHANGE              0
:WADSWORTH RD CROSSING
DP-19     LIBERTYVILLE IL     OPEN              NO CHANGE              0
:RIVERSIDE PARK
DP-18     LIBERTYVILLE IL     OPEN              NO CHANGE              0
:OAK SPRING RD SOUTH END OF ADLER MEMORIAL PARK
DP-17     LIBERTYVILLE IL     OPEN              NO CHANGE              0
:RT 137 BUCKLEY RD
DP-16     LIBERTYVILLE IL     OPEN              NO CHANGE              0
:RT 120 BELEVIDERE RD
DP-15     GURNEE IL           OPEN              NO CHANGE              0
:WASHINGTON ST
DP-14     GURNEE IL           OPEN              NO CHANGE              0
:GRAND AVE
DP-13     GURNEE IL           OPEN              ICE MELTING            0
:RT. 41 SOUTH END OF COUNTY FOREST PRESERVE
DP-12     WADSWORTH IL        OPEN              NO CHANGE              0
:WADSWORTH RD SOUTH END WADSWORTH PRAIRIE NATURE PRESERVE
DP-11     WADSWORTH IL        OPEN              ICE MELTING            0
:RT 173 SOUTH END OF VAN PATTEN WOODS
DP-10     ZION IL             OPEN              ICE MELTING            0
:RUSSELL RD NORTH END OF VAN PATTEN WOODS

DU PAGE RIVER...
DU-9      SHOREWOOD IL        OPEN              NO CHANGE              0
:S RIVER RD
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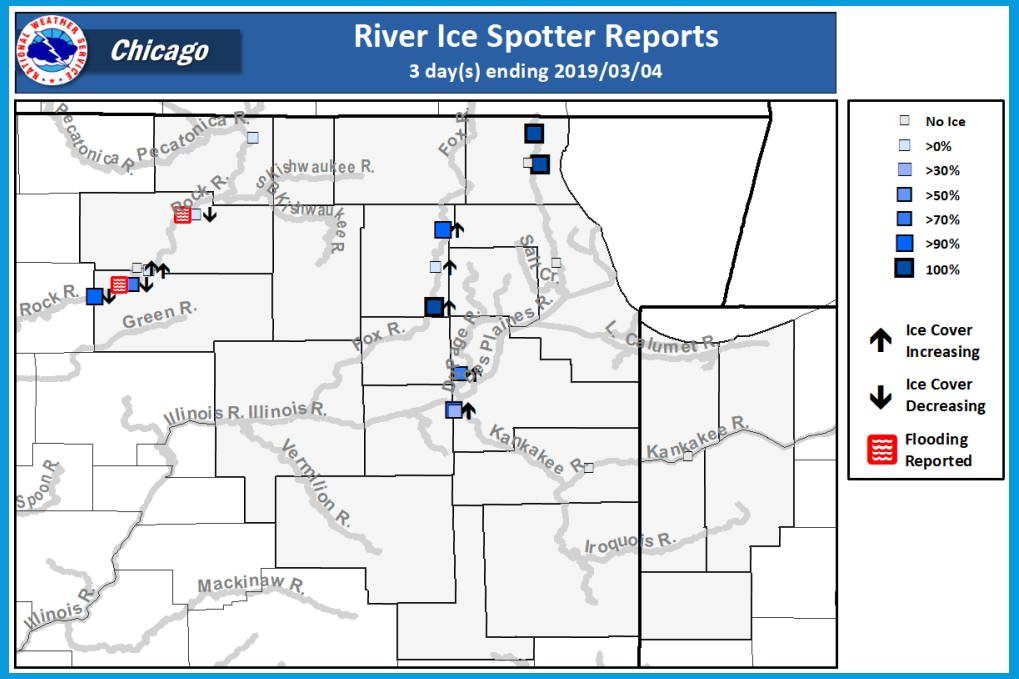
## Weekly River Ice Summary

- Sent out publicly to provide a summary of reported river ice conditions
- Sent late morning on Mondays

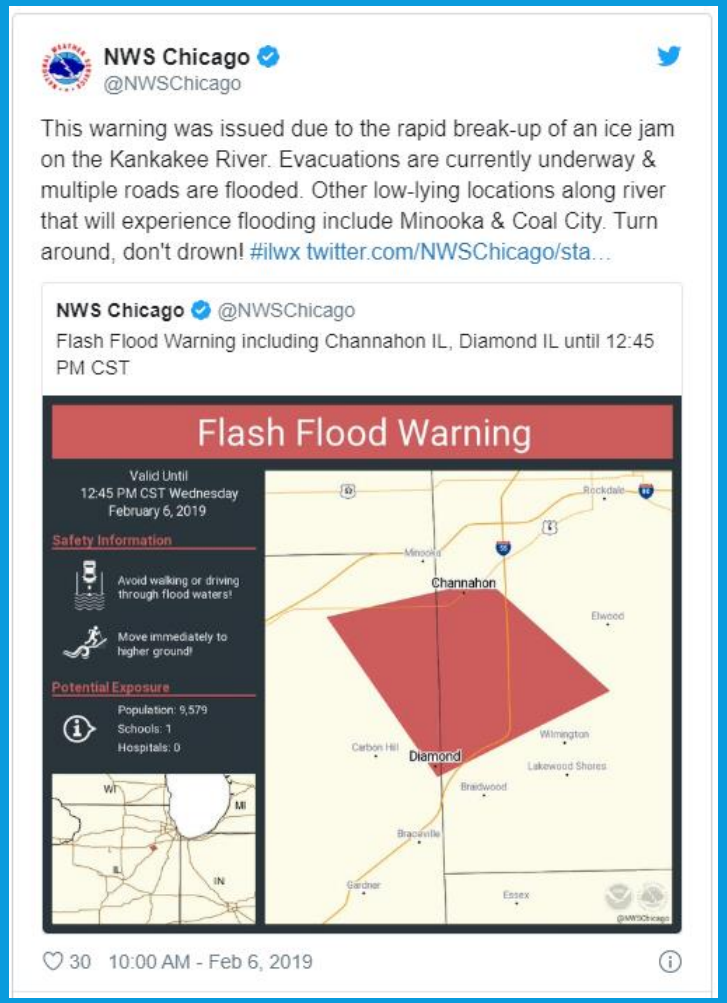
# HOW IS INFORMATION USED




## Map of Recent Reports

- Used to see areas of ice cover increasing/decreasing, or areas where ice jams may be forming

# HOW IS INFORMATION USED




## Flood Warnings

- Reports of rapid ice jam formation or break-up may be used to warn affected areas of possible flooding

# OTHER LINKS AND RESOURCES

**NWS Chicago River Ice Spotter Network page**
www.weather.gov/lot/River_Ice_Spotter_Network

**NWS Chicago Hydrology Program page**
https://www.weather.gov/lot/hydrology_program_overview

**Latest weather forecasts and warnings**
https://www.weather.gov/lot

**Latest river observations and forecasts**
water.weather.gov

**W. Scott Lincoln, GISP**
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